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ABSTRACT

This study compared Stanford Achievement Test (SAT-9) academic subtest scores by students' grade, gender, and ethnicity and across different educational programs (e.g., Title I and special education). The study sample consisted of 144,701 students from public schools in a large city in the Southwest United States (grades 1-11). Raw data were taken from seven subject areas, and normal curve equivalents from these seven areas were selected as data elements. Students' information and academic scores were obtained from the same schools. Data analysis indicated that there were significant differences between scores by gender and ethnicity in all grades. Generally, female students' scores were significantly higher than male students' scores, especially in reading, language, and spelling. Females had higher math scores until grade 9. Male students had higher science scores. Across all grades, there were differences among ethnic groups. White and Asian students had higher scores than black and Hispanic students. SAT-9 scores differed significantly by program and subtest. The Texas Assessment of Academic Skills (TAAS) was selected to measure academic achievement. The results indicated that the prediction rates of TAAS by SAT-9 in reading and math were substantial. The prediction rates of science and social studies were lower. (Contains 10 references.) (SM)

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A Comparison of Stanford Achievement Test (SAT-9) Performance Across Grade, Gender, Ethnicity, and Educational Program Placement

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A Comparison of Stanford Achievement Test (SAT-9) Performance
Across Grade, Gender, Ethnicity, and Educational Program Placement

Purpose

The purpose of this study was to compare Stanford Achievement Test (SAT-9) academic subtest scores by students' grade, gender, and ethnicity. Additionally, differences in students' SAT-9 across different educational programs (e.g., Title I; Special Education) and prediction of academic achievement by SAT-9 were addressed. The results would provide local norms of students' achievement performance to assist administrators, teachers, and parents in the improvement of students' achievement, as well as stimulate questions for further research.

Background

Comparisons of students' academic performance by gender, grade, and ethnicity have received much attention over the years. Maddahian (1998) analyzed the School Readiness Language Development program, and indicated a significant impact by students' gender, ethnicity and grades. Students' background, age, class year, sex, and ethnicity were also found to influence students' favorable classroom involvement. Kolls (1998) indicated that Title 1 programs should consider students' language fluency, ethnicity, gender, and program service in providing service options. Vanneman (1998) studied writing performance across three grades and found that White students outperformed Black and Hispanic students, and females outperformed males. It was noted that math educators should consider factors of gender and ethnicity (Park, Bauer, & Sullivan, 1998) when

providing elementary math instruction. Chapin (1998) suggested that grade, gender, and ethnic group influenced students' social studies performance.

The SAT-9 is a strong indicator of students' academic performance, and has been used successfully for comparative purposes in statewide and nationwide academic development initiatives. Devlin-Scherer (1997) used the SAT-9 to evaluate the effects on student learning of transforming professional development in the schools. Furukawa (1998) explored cognitive processing strategies that influence students' spelling, definitions, and reading using the SAT-9. Neff (1995) tested students' reading comprehension using the SAT-9 to compare methods for teaching strategies. Koopmans (1998) identified the effects of Basic Skills programs on math achievement using the SAT-9 as a standard score index. The SAT-9 was also used to assess the effects of random class assignment on elementary students' reading and math achievement (Zaharias, Achilles, & Cain, 1995).

Seldom have these reports, which use the SAT-9 as a performance measure, analyzed results by grade, gender, ethnicity, and pre-existing program membership. Based on the recommendations of previous studies, this project analyzes and discusses students' academic performance in these areas.

Methods

Subjects

A total of 144,701 students in the southwest urban area of the United States from first grade to eleventh grade were used as sample, which included 70,626 males and 71,701 females.

Data Sources

Raw data were taken from public schools in a large city in the southwest USA. Normal Curve Equivalents (NCE) from seven subject areas and a total achievement were selected as data elements. Students' information and academic scores were obtained from the same public schools.

Data Analysis

Descriptive statistics were used to calculate students' SAT-9 scores by grade. A two-way ANOVA was used to compare SAT-9 scores by students' gender and ethnic group. A T-test was used to compare SAT-9 by different students' groups. Multiple Linear Regression was used to test prediction level of students' academic achievement by SAT-9.

Results

Descriptive Statistics

Table 1. Distribution of Stanford Achievement Tests by grade

Grade	1	2	3	4	5	6	7	8	9	10	11
Read	49.3	43.8	43.0	38.5	37.8	36.3	36.2	37.1	38.5	42.3	44.4
Math	43.8	42.4	43.8	47.3	44.6	45.0	41.9	40.8	37.2	44.1	46.0
Language		45.8	44.1	43.9	45.0	44.0	40.6	44.1	43.5	43.1	46.8
Science	41.2	37.7	39.2	42.5	40.1	40.1	40.9	37.3	37.3	41.9	44.4
Social Science				38.5	39.0	38.1	37.0	39.1	38.5	43.7	44.4
Spelling		46.9	47.0	42.4	42.8	42.8	41.8	38.6	42.0	44.0	47.2
Skill				40.7	40.4	40.4	38.3	38.8	38.2	41.1	39.5
Total	46.2	43.6	43.7	43.0	41.4	41.0	40.4	40.1	40.0	44.0	46.1

SAT-9 scores by grade would be listed using tables. Table 1 provided data showing that the NCE scores of the sample were lower than the national norms, which had a mean of 50. Because too comparisons of many data to analyzed in detail, three grades (grades 4, 8, and 10) were selected as the representatives of elementary, middle, and high schools.

Comparison of Gender, and Ethnicity

MANOVA revealed that there were significant differences between SAT-9 scores by gender and ethnicity in all grades, only few subjects were insignificance between comparison of gender. All differences of grades between ethnic groups were significant.

Table 2. The results of MANOVA of 4th grade

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	Reads	1271983.17	1	1271983.17	32.32	0.00
	Maths	597.82	1	597.82	0.01	0.90
	Langs	2734017.52	1	2734017.52	75.82	0.00
	Scies	230933.05	1	230933.05	7.08	0.01
	Socis	640289.33	1	640289.33	18.48	0.00
	Spels	3995051.22	1	3995051.22	86.79	0.00
	Skils	526515.88	1	526515.88	15.18	0.00
	Totals	561514.11	1	561514.11	21.21	0.00
Ethnicity	Reads	62297991.80	3	20765997.27	527.59	0.00
	Maths	61864427.88	3	20621475.96	504.47	0.00
	Langs	51301174.40	3	17100391.47	474.23	0.00
	Scies	65842590.00	3	21947530.00	672.66	0.00
	Socis	61128432.77	3	20376144.26	588.13	0.00
	Spels	51811096.27	3	17270365.42	375.20	0.00
	Skils	68310724.18	3	22770241.39	656.55	0.00
	Totals	51884476.24	3	17294825.41	653.14	0.00

Table 3. The results of MANOVA of 8th grade

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	Reads	3114254.85	1	3114254.85	81.10	0.00
	Maths	225651.04	1	225651.04	6.39	0.01
	Langs	5759928.76	1	5759928.76	174.46	0.00
	Scies	145072.09	1	145072.09	5.18	0.02
	Socis	409750.60	1	409750.60	13.05	0.00
	Spels	7127404.40	1	7127404.40	175.48	0.00
	Skils	1838627.00	1	1838627.00	56.50	0.00
	Totals	1604792.27	1	1604792.27	64.85	0.00
Ethnicity	Reads	100206086.27	3	33402028.76	869.84	0.00
	Maths	97092009.39	3	32364003.13	916.95	0.00
	Langs	50889843.37	3	16963281.12	513.79	0.00
	Scies	71941874.01	3	23980624.67	856.40	0.00
	Socis	65468058.91	3	21822686.30	694.88	0.00
	Spels	61616038.62	3	20538679.54	505.67	0.00
	Skils	100294681.07	3	33431560.36	1027.39	0.00
	Totals	72441317.54	3	24147105.85	975.86	0.00

Table 4. The results of MANOVA of 10th grade

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Gender	Reads	1273334.52	1	1273334.52	35.21	0.00
	Maths	5886.80	1	5886.80	0.18	0.67
	Langs	4052499.95	1	4052499.95	134.62	0.00
	Scies	24725.31	1	24725.31	0.86	0.35
	Socis	50497.49	1	50497.49	1.63	0.20
	Spels	3869476.29	1	3869476.29	110.86	0.00
	Skils	504280.80	1	504280.80	17.41	0.00
	Totals	696571.31	1	696571.31	31.19	0.00

Table 4. Continued.

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Ethnicity	Reads	89402628.51	3	29800876.17	824.13	0.00
	Maths	70748703.85	3	23582901.28	736.19	0.00
	Langs	58213001.53	3	19404333.84	644.59	0.00
	Scies	58291498.90	3	19430499.63	676.76	0.00
	Socis	52573604.98	3	17524534.99	565.40	0.00
	Spels	46076847.96	3	15358949.32	440.04	0.00
	Skils	79370153.51	3	26456717.84	913.47	0.00
	Totals	60837126.41	3	20279042.14	908.04	0.00

Gender. Generally, female students' SAT-9 scores were significantly higher than those of male students from grade 1 to grade11, especially in Reading (F=81.1**), Language (F=174.5**), and Spelling (F=175.5**). Female students had higher Math scores from grade 1 to grade 9, but lost this advantage at grades 10 and 11. Male students had higher scores in Science (F=5.2*).

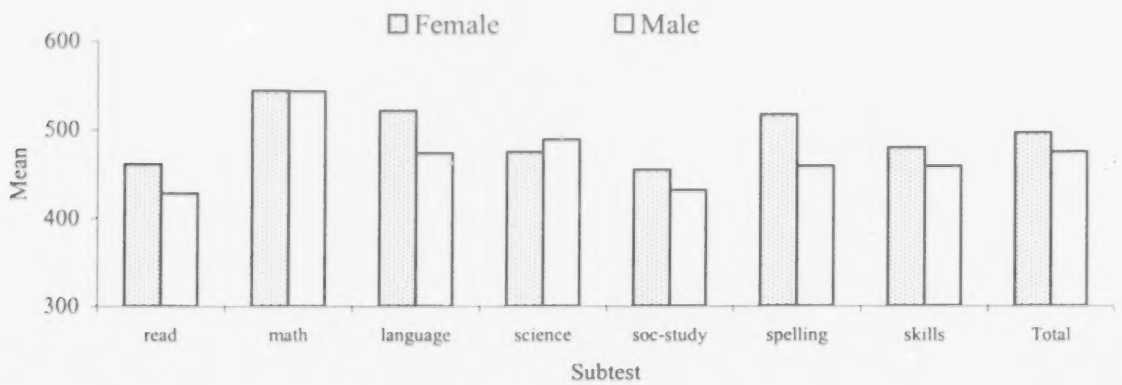

Figure 1. Comparison of SAT-9 subtest scores by gender (4th grade)

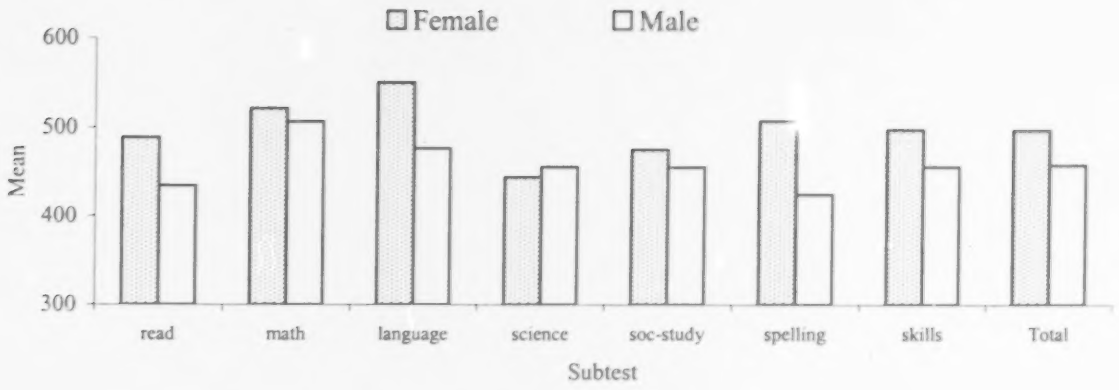

Figure 2. Comparison of SAT-9 subtest scores by gender (8th grade)

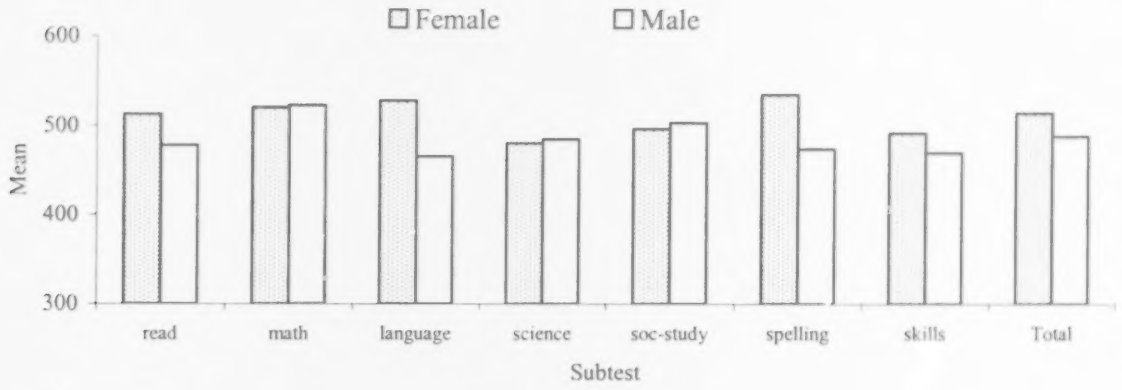

Figure 3. Comparison of SAT-9 subtest scores by gender (10th grade)

Ethnicity. Across all grades there were significant differences between ethnic groups. White and Asian students had higher scores and Black and Hispanic students' score were lower.

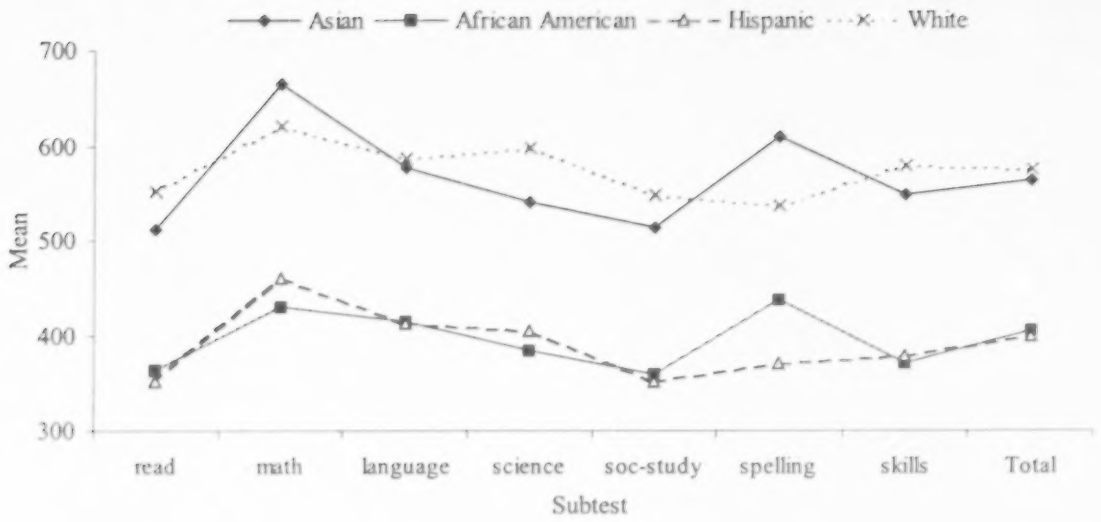

Figure 4. Comparison of SAT-9 subtest scores by ethnicity (4th grade)

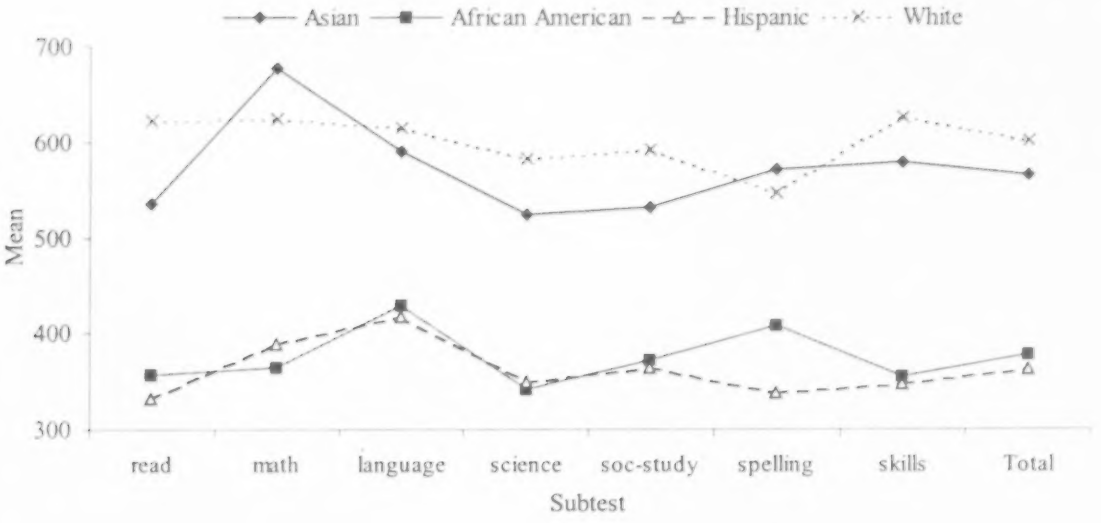

Figure 5. Comparison of SAT-9 subtest scores by ethnicity (8th grade)

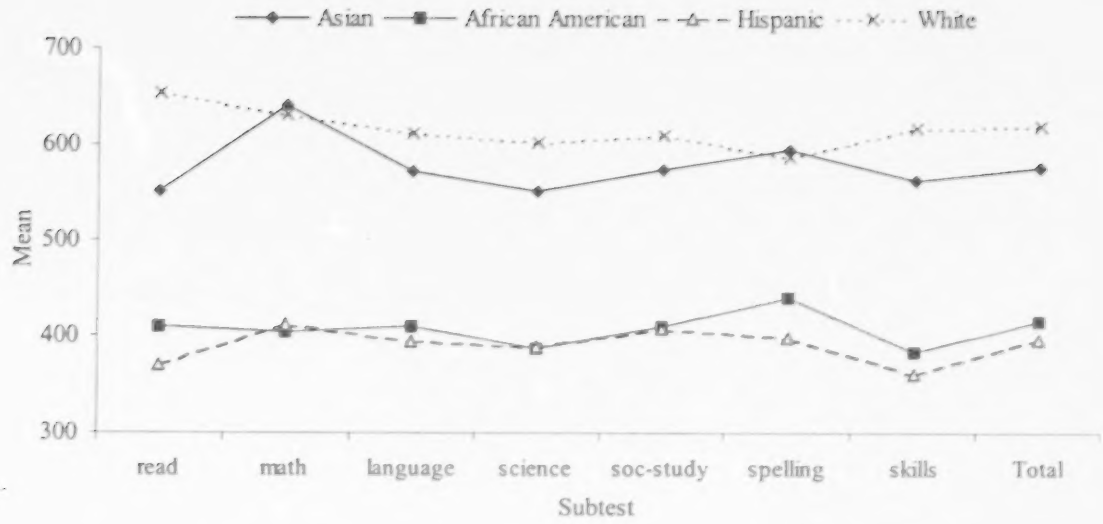

Figure 6. Comparison of SAT-9 subtest scores by ethnicity (10th grade)

SAT-9 Score in Different Groups

SAT-9 scores by program and subtest indicated significant differences.

Table 5. Stanford Achievement Tests NCE by group

	LEP		At-Risk		Special Edu.		Bilingual		ESL		Gifted		Migrant	
	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
Reading	25.7	43.3	27.9	48.1	21.8	42.7	28.1	40.7	22.8	42.3	66.1	37.1	29.9	40.4
Math	35.5	44.7	33.2	49.2	26.6	45.2	40.6	43.2	33.3	44.2	68.4	39.9	38.1	43.2
Language	31.7	46.6	33.4	51.3	26.4	46.3	34.2	44.2	29.5	45.6	67.5	40.7	36.0	44.0
Science	30.3	42.0	31.0	45.5	27.4	41.6	32.3	40.2	28.6	41.2	62.7	37.1	33.5	40.0
Social Science	27.5	42.0	29.6	48.0	25.5	41.3	28.5	39.7	26.6	41.0	63.1	35.9	32.2	39.4
Spelling	28.8	46.4	33.0	50.4	25.6	45.7	29.0	43.8	26.8	45.2	64.3	40.5	34.1	43.3
Skills	25.1	42.9	27.7	49.8	21.8	42.0	29.3	40.0	23.1	41.8	66.2	35.6	30.3	39.7
Total	30.7	44.9	31.8	48.7	26.8	44.3	32.9	42.7	28.4	44.0	65.3	39.4	34.3	42.5

Prediction of Academic Achievement by SAT-9

The Texas Assessment of Academic Skills (TAAS) was selected as a measure of academic achievement. The results indicated that the prediction rates of TAAS by SAT-9 in reading and math were substantial. The prediction rates of science and social studies were lower.

Table 6. Regression of TAAS by SAT-9

	R^2	F	B	t	p
Reading	.404	36441.36**	.083	190.90	.000
Math	.373	32091.62**	.076	179.14	.000
Science	.034	6.61*	.040	2.57	.011
Social Studies	.061	11.92**	.437	3.45	.001

Educational Importance

Stanford Achievement Test subtests were effective tools for examination and comparison of students' academic performance nationwide. This study showed that local means were below national levels. In most subject areas, male students' scores were lower that those of female students, and white students' scores were significantly higher than black and Hispanic students' scores. There were significant differences between different programs and groups by grades. This information will assist educators' understanding of students' characteristics for the purpose of improving students' achievement by effective administration and teaching strategies.

These results also provided information for studies of cross-district/state performance and for evaluation of teaching and learning programs. Because of the

limitations, this study could not explain the reasons for these differences, so these findings suggest further investigation.

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